The opinion in support of the decision being entered today is not binding precedent of the Board

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Paper No. ~~62~~ //

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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PAT & T.M. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

ROBIN **CHEUNG**, ASOKA SINHA, AVI TEPMAN, and DAN CARL,
Junior Party
(Patent 6,136,163[1]),

v.

THOMAS **RITZDORF**, E. HENRY STEVENS, LIN LIN CHEN, LYNDON W. GRAHAM, and CURT DUNDAS,

Senior Party
(Application 09/882,613[2]).

Patent Interference No. 105,113

DECISION ON PRELIMINARY MOTIONS

[1] Based on Application 09/263,126, filed 5 March 1999. Assigned to Applied Materials, Inc.

[2] Filed 15 June 2001. Assigned to Semitool, Inc. The "Notice Declaring Interference" (Paper No. 1) accords the Ritzdorf application the benefit as to Count 1 of: (a) U.S. Application 09/386,734, filed 31 August 1999; (b) PCT/US/02504, filed 4 February 1999; (c) U.S. Provisional Application 60/087,432, filed 1 June 1998; and (d) U.S. Application 09/018,783, filed 4 February 1998.

Before MARTIN, Administrative Patent Judge, McKELVEY, Senior Administrative Patent Judge, and SCHAFER, Administrative Patent Judge.

MARTIN, Administrative Patent Judge.

A. The motions before us

The motions before us, which were argued at the 25 March 2004 oral hearing, are:[3]

(a) "Cheung Preliminary Motion 1 (attacking benefit)"; and

(b) "Cheung Preliminary Motion 2 (for judgment on unpatentability under 112, ¶1)."

These motions contend that Ritzdorf's involved and benefit applications fail to provide 35 U.S.C. § 112, first paragraph, written description support for the terms "thermal anneal chamber" and "annealing chamber" in Ritzdorf's claims and in Count 1, the sole count.

B. The invention at issue

The subject matter of the interference is an electro-chemical deposition system or electroplating system for forming a metal layer on a wafer/substrate. Cheung et al. Patent 6,136,613 (CX[4] 2001) (hereinafter "the Cheung patent"), col. 1, ll. 8-11. Cheung's Figure 3 is a

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[3] In an "Order - Rule 645" issued 10 March 2004 (Paper No. 58), a Trial Section panel denied "Ritzdorf Miscellaneous Motion 1 (for Leave Under 35 [sic: 37] C.F.R. §§ 1.635 and 1.645 To File a Belated Contingent Motion Under 35 C.F.R. § 1.633(i))" seeking to add claims 78-87 to Ritzdorf's involved '613 application and to designate those claims as corresponding to Count 1. Furthermore, the "Notice of Motions To Be Withdrawn" (Paper No. 56) indicates that the parties, pursuant to an agreement to filed in this interference, have withdrawn "Cheung Preliminary Motion 3 (for judgment based on unpatentability on prior art)" and "Ritzdorf Motion No. 1 (To Designate [Cheung] Claims 6-9 As Corresponding to the Count)."

[4] Cheung Exhibit. Ritzdorf's exhibits are designated herein by "RX."

top schematic view of such an apparatus, which is described at column 4, line 35 to column 5, line 6:

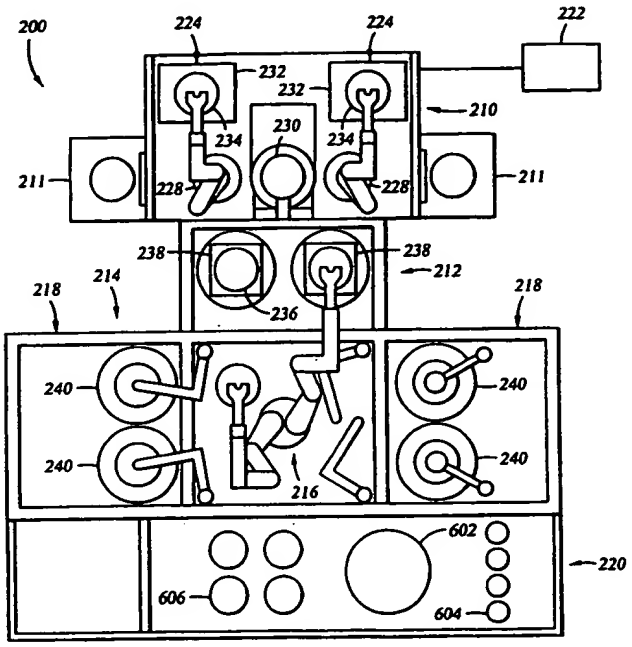

Fig. 3

The electroplating system platform 200, which is enclosed in a clean environment using panels such as plexiglass panels, generally comprises a loading station 210, a thermal anneal chamber 211, a spin-rinse-dry (SRD) station 212, and a mainframe 214 including a mainframe transfer station 216 and a pair of processing stations 218. Two loading station transfer robots 228 provide access to wafers in (a) two wafer cassette receiving areas 224 in loading station 210, (b) a wafer orientor 230 in loading station 210, (c) two thermal anneal chambers 211, and (d) two SRD modules 238 in SRD station 212. Robots (unnumbered) in main frame transfer station 216

transfer wafers between the SRD modules 238 in SRD station 212 and the four electrolytic processing cells 240 in processing stations 218.

Referring to Cheung's Figure 17, reproduced below, numeral 211 designates a "rapid thermal anneal" (RTA) chamber having an enclosure 902 which includes a base 908, a sidewall 910, and a top 912 (col. 19, ll. 39-42).

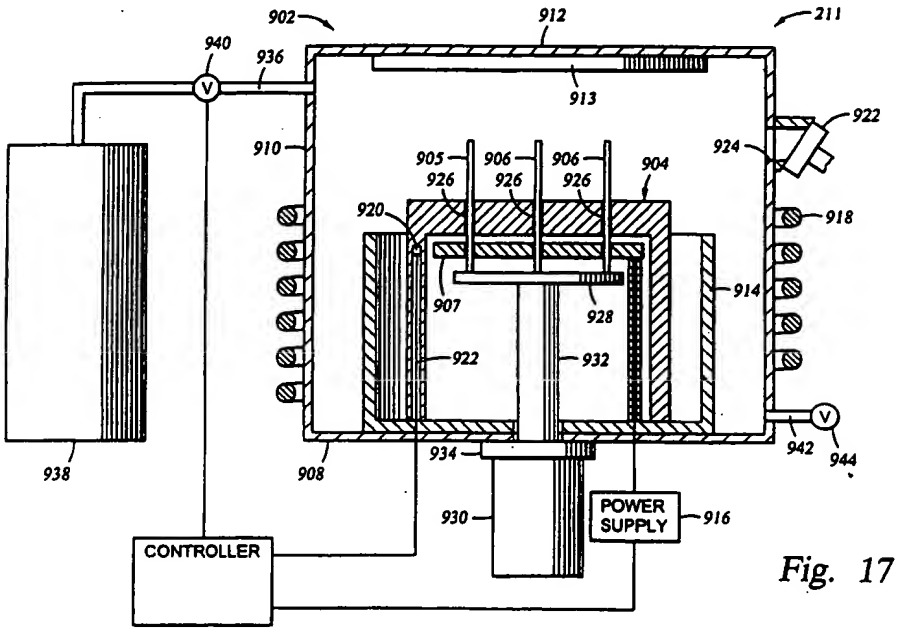

Fig. 17

Count 1 is defined in the "Notice Declaring Interference"[5] (at 5) as "A deposition system according to claim 12 of [Cheung] U.S. Patent No. 6,136,163." That claim is reproduced below with the addition of reference numerals from Cheung's Figure 3:

[5] Paper No. 1.

12. A system for depositing a layer on a substrate, comprising:

at least one electrolyte processing cell [240]

at least one annealing chamber [211];

at least one substrate cleaner [238]; and

a substrate transfer apparatus [228 and 216] adapted to access the electrolyte processing cell [240], the annealing chamber [211], and the substrate cleaner [238].

Ritzdorf instituted this interference by copying claims 1-5 and 10-14 of the Cheung patent either exactly or in modified form as claims 68-77 in Ritzdorf's involved Application 09/882,613 (CX 2002) (hereinafter "'613 application"). See '613 application file, "Amendment Under 37 C.F.R. § 1.607" (Paper No. 7).

The claims which currently stand designated as corresponding to Count 1 are claims 1-5 and 10-14 of the Cheung patent and claims 68-77 of the '613 application. See "Notice Declaring Interference" at 5; "Order Setting Times" (Paper No. 19) at 3, ¶ iii.

Cheung Preliminary Motion 1 contends that the term "annealing chamber" in Count 1 lacks 35 U.S.C. § 112, ¶ 1 written description support in any of Ritzdorf's benefit applications. Cheung Preliminary Motion 2, which we will address first, similarly contends that the terms "thermal anneal chamber" in independent claims 68 and 73 and "annealing chamber" in independent claim 70 lack § 112, ¶ 1 written description support in the involved '613 application. Motion 2 also contends that other limitations in the dependent claims lack written description support.

C. Cheung Preliminary Motion 2

The parties disagree as to whether Ritzdorf's claims should be construed in light of Ritzdorf's '613 application disclosure or in light of Cheung's patent, where the claim language at issue originated. Ritzdorf, citing In re Spina, 975 F.2d 854, 856, 858, 24 USPQ2d 1142, 1144, 1145 (Fed. Cir. 1982) and Rowe v. Dror, 112 F.3d 473, 479, 42 USPQ2d 1550, 1554 (Fed. Cir. 1997), would have us construe the claims in light of Cheung's patent (Opposition 2, at 16-17). Cheung, quoting the requirement of 37 CFR § 1.633(a) that "[i]n deciding an issue raised in a motion filed under this paragraph (a), a claim will be construed in light of the specification of the application or patent in which it appears," correctly argues that Ritzdorf's claims should be construed in light of Ritzdorf's disclosure. Motion 2, at 16[6]; Reply 2, at 2. See also Cultor Corp. v. A.E. Staley Mfg. Co., 224 F.3d 1328, 1332, 56 USPQ2d 1208, 1211 (Fed. Cir. 2000):

> Every patent claim is construed in the context of the specification in which it appears as part of the patent document. When a claim is copied from another patent for interference purposes, it must be supported by the specification of the copier. In Spina the application into which the claim was copied was deemed to contain sufficient written description to support the claim, although the structure by which the claimed function was performed was not the same as the structure shown in the specification from which the claim was copied. The court in Spina did not hold that the copier of a claim for interference purposes thereby acquires the benefit of the descriptive text of the copied patent.
>
> The claims to which Cultor demonstrated priority in the interference are construed in light of Cultor's specification; it becomes irrelevant whether the specific text of the claim was copied from the interfering patent. See Young Dental Mfg. Co. v. Q3 Special Prods., Inc., 112 F.3d 1137, 1143, 42 USPQ2d

[6] Specifically, the motion asserts that "the involved Ritzdorf application fails to provide a written description for the annealing chamber claim limitations, interpreted in light of Sach's [sic: Ritzdorf's] application (37 CFR 1.633(a)), rendering the claims unpatentable under 35 USC 112, first paragraph."

> 1589, 1594 (Fed. Cir. 1997) ("The specification that is relevant to claim construction is the specification of the patent in which the claims reside.").

As explained in Intellectual Property Development Inc. v. UA-Columbia Cablevision of Westchester Inc., 336 F.3d 1308, 1314, 67 USPQ2d 1385, 1389 (Fed. Cir. 2003):

> In the absence of an express intent to impart a novel meaning to claim terms, the words are presumed to take on the ordinary and customary meanings attributed to them by those of ordinary skill in the art. See, e.g., Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1325 [63 USPQ2d 1374] (Fed. Cir. 2002). The ordinary and customary meaning of a claim term may be determined by reviewing a variety of sources. Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc., 334 F.3d 1294, 1299 [67 USPQ2d 1132] (Fed. Cir. June 27, 2003). Some of these sources include the claims themselves, see Process Control Corp. v. HydReclaim Corp., 190 F.3d 1350, 1357 [52 USPQ2d 1029] (Fed. Cir. 1999); dictionaries and treatises, Tex. Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1202 [64 USPQ2d 1812] (Fed. Cir. 2002); and the written description, the drawings, and the prosecution history, see, e.g., DeMarini Sports, Inc. v. Worth, Inc., 239 F.3d 1314, 1324 [57 USPQ2d 1889] (Fed. Cir. 2001).

As evidence of the meaning of the disputed terms, the motion relies on definitions of "chamber" and other terms from Webster's II New Collegiate Dictionary (2001 ed.) (hereinafter Webster) (CX 2008, CX 2023) as well as on a declaration by Dr. Robert Geffken. Ritzdorf's opposition counters with a declaration by inventor Thomas Ritzdorf. This testimony is entitled to consideration only if the meanings of the disputed terms cannot be ascertained from the intrinsic evidence and the relevant dictionaries and treatises. See Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1583, 39 USPQ2d 1573, 1577 (Fed. Cir. 1996) ("In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such

circumstances, it is improper to rely on extrinsic evidence."). See also Vitronics, 90 F.3d at 584 n.3, 39 USPQ2d at 1578 n.6:[7]

> Although technical treatises and dictionaries fall within the category of extrinsic evidence, as they do not form a part of an integrated patent document, they are worthy of special note. Judges are free to consult such resources at any time in order to better understand the underlying technology and may also rely on dictionary definitions when construing claim terms, so long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents."

Thus, the analysis of a disputed claim term begins with the relevant dictionaries and treatises. See Kumar v. Ovonic Battery Co., 351 F.3d 1364, 1367, 69 USPQ2d 1220, 1222 (Fed. Cir. 2003) ("Under our precedent in Texas Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1201-02 [64 USPQ2d 1812[(Fed. Cir. 2002), and Inverness II [Inverness Med. Switz. GmbH v. Warner Lambert Co.], 309 F.3d [1373,] 1378 [64 USPQ2d 1933 (Fed. Cir. 2002)], we look first to the dictionary definition of a contested term."). In In re Thrift, 298 F.3d 1357, 1364, 63 USPQ2d 2002, 2006 (Fed. Cir. 2002), the court likewise began an analysis of a disputed term In an application claim by considering dictionary definitions:

> [W]e interpret the phrase "speech user agent" consistent with its plain meaning: an interface that allows the user to interact with the system by speaking. See IBM Dictionary of Computing 638 (10th ed. 1994) (defining "speech recognition" as "[t]he recognition of voice communication as a series of words or sentences"); Van Nostrand Reinhold Dictionary of Information Technology 473 (3d ed. 1989) (defining "speech recognizer" as "[i]n man-machine interfaces, a system that receives spoken word inputs and identifies the message. The system output can then be used to initiate appropriate actions or responses."); Johnson Worldwide Assocs., Inc. v. Zebco Corp., 175 F.3d 985, 989, 50 USPQ2d 1607, 1610 (Fed.

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[7] The F.3d footnote number differs from USPQ2d footnote number due to footnote numbering errors in the USPQ2d version of this decision.

> Cir. 1999) ("The general rule is, of course, that terms in the claim are to be given their ordinary and accustomed meaning."). Although an applicant may be his own lexicographer, Markman v. Westview Instruments, Inc., 52 F.3d 967, 980, 34 USPQ2d 1321, 1330 (Fed. Cir. 1995) (en banc), aff'd, 517 U.S. 370 [38 USPQ2d 1461] (1996), nothing in the specification defines the phrase "speech user agent" differently from its ordinary meaning.

Cheung's motion (at 16) relies on the definition of "chamber" as "[a]n enclosed space or compartment: CAVITY." Webster[8] (CX 2008). The reply additionally cites (at 4, ¶ 5) the definition of "enclose" as "[t]o surround on all sides." Webster 370 (CX 2023). Although some of the language in the motion appears to equate "chamber" with a sealed enclosure,[9] Cheung's counsel explained at oral hearing that the term "chamber" in and of itself does not imply a sealed enclosure. This information was provided when counsel was asked whether the terms "spin-rinse-dry (SRD) chamber" in Cheung's claim 1 and "spin-rinse-dry chamber" in Cheung's claim 13 should be understood as requiring that the spin-rinse-dry apparatus depicted in Cheung's Figure 5 (reproduced below) include a cover, which is not shown in the figure but is described as

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[8] The page number for this definition does not appear in the exhibit.

[9] Specifically, the motion, citing paragraph 11 of Dr. Geffken's declaration (CX 2009), argues:

> In semiconductor substrate processing apparatus, chambers are typically used when the particular process requires a controlled gaseous environment, e.g., sputtering deposition and chemical vapor deposition. . . . [F]or anneal temperatures in the range of 250 °C - 400°C, the oxidation rates of Cu are substantial, and therefore strict control of the gaseous environment is required. Annealing in temperature ranges of 250°C - 400 °C requires a chamber to provide a controlled gaseous environment. (Cheung Exh. 209, ¶11).

Motion 2, at 5, ¶ 7 (emphasis added).

an optional feature at column 5, lines 27-28 ("Alternatively, a removable cover could also be used."):

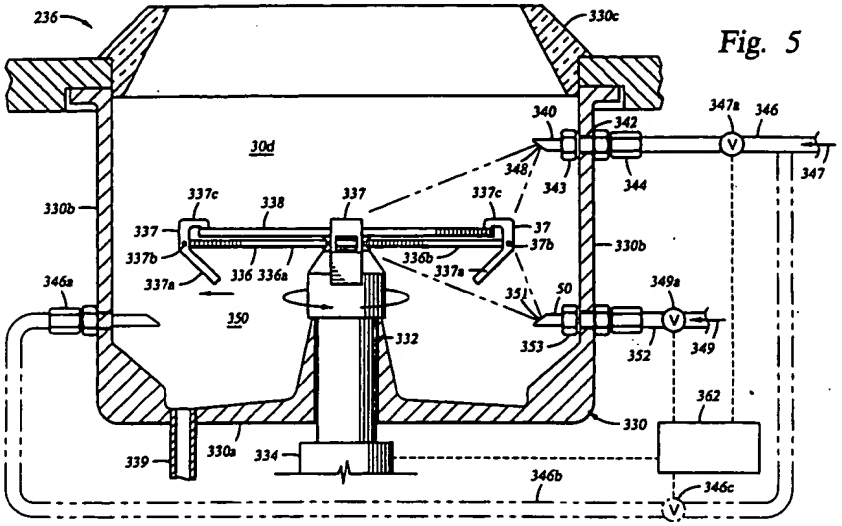

Fig. 5

Counsel explained that the cited dictionary definitions of "chamber" and "enclose" do not require the presence of a top:

> JUDGE MARTIN: . . . Claims 1 and 13 use the term chamber to apply to the spin, rinse and dry apparatus, and I note that in figures 4 and 5, there is no top on the spin, rinse and dry apparatus although there is reference to an optional top.
>
> MR. BOOTH: You can optionally have one or not.
>
> JUDGE MARTIN: And so I assume you construe that language to mean there is a top on the spin, rinse and dry unit?
>
> MR. BOOTH: Well, I submit that -- I mean, an enclosure, I mean, requires it to be surrounded on all sides. At the chamber, they have air for the spin, rinse and dry, has it enclosed all the way around. It may be open on the top or it may not be open on the top.
>
> But in the Ritzdorf application, all they ever show is something that is on one side of the wall. It doesn't have something that surrounds it on all sides.

JUDGE MARTIN: Does your claim language spin, rinse and dry chamber require that there be a top on the spin, rinse and dry apparatus?

MR. BOOTH: No.

Hearing Transcript[10] at 24, l. 5 to p. 25, l. 8. Counsel based this interpretation on the above-noted definition of "enclose" to mean "surround on all sides":

MR. BOOTH: The dictionary says surround on all sides.

JUDGE MARTIN: So you would exclude the top and bottom?

MR. BOOTH: That isn't a side.

JUDGE MARTIN: That isn't a side?

MR. BOOTH: It excludes the top in that context.

Hearing Transcript at 26, ll. 6-13. Counsel for Ritzdorf agreed that the term "chamber" does not require a top:

MR. ROCKEY: . . .

. . . .

But I think perhaps the more important point is that when you read chamber the way Cheung is suggesting [in the preliminary motion] that it must be read, it's not even consistent with the specification. I think as Judge Martin pointed out, that's -- I think that's a very important point.

Another example, if you look at --

JUDGE McKELVEY: Because it doesn't have to have a top?

MR ROCKEY: Yeah, exactly, exactly. . . .

Hearing Transcript at 29, l. 16 to p. 30, l. 3. Other than agreeing that a top is not required, Ritzdorf has not offered a definition of "chamber." Thus, the parties appear to agree that

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[10] Paper No. 60.

"chamber," when given its ordinary meaning, refers to an enclosure which has surrounding sides but which may or may not have a top and thus is not necessarily sealed. Although Cheung's argument that a chamber need only be enclosed on the sides suggests that a bottom is also not required, we need not decide this question because Cheung does not deny that the disclosed annealing apparatus on which Ritzdorf relies has a bottom.

The next matter to address is whether a sealed enclosure is implied when "chamber" is modified by "anneal" or "annealing." Although neither party provided a definition of "anneal," we note that term is defined as follows in The Random House Dictionary of the English Language 83 (2d ed. 1987) (copy enclosed): "1. to heat (glass, earthenware, metals, etc.) to remove or prevent internal stress." This definition does not mention or imply a need to control the atmosphere which surrounds the material being annealed and thus does not imply that annealing must occur in a sealed enclosure. Nor is such a limitation implied when "chamber" is modified by "thermal anneal." Consequently, when given their ordinary meanings, the terms "thermal anneal chamber" and "annealing chamber" refer to an annealing apparatus which is not necessarily sealed but which has sides for surrounding the material to be annealed.

Furthermore, nothing in Ritzdorf's claims suggests that the ordinary meaning arrived at above is incorrect. See E-Pass Techs., Inc. v. 3Com Corp., 343 F.3d 1364, 1370, 67 USPQ2d 1947, 1949 (Fed. Cir. 2003)("When determining a claim term's ordinary meaning, we also look to the usage of the disputed claim term in context. Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc., 334 F.3d 1294, 1300-01 [67 USPQ2d 1132 , 1137] (Fed. Cir. 2003). While dependent claim 77 recites that "the thermal anneal chamber further comprises a gas inlet adapted to

introduce one or more gases into the thermal anneal chamber," that recitation does not require that the chamber be sealed or have a top.

> [W]e next look to the specification to determine "whether the presumption of ordinary and customary meaning is rebutted." Tex. Digital, 308 F.3d at 1204; see also Inverness Med. Switz. GmbH v. Princeton Biomeditech Corp., 309 F.3d 1365, 1371-72 [64 USPQ2d 1926] (Fed. Cir. 2002). The patentee may have acted as his own lexicographer and imbued the claim terms with a particular meaning or "disavowed or disclaimed scope of coverage, by using words or expressions of manifest exclusion or restriction." Tex. Digital, 308 F.3d at 1204.

E-Pass, 343 F.3d at 1368, 67 USPQ2d at 1950. See also In re Morris, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997): "[T]he PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification."). Ritzdorf's specification does not include a definition for "chamber" or "anneal" or otherwise signal an intention to give these terms meanings other than their ordinary meanings.[11]

As authority for considering Dr. Geffken's testimony about the meanings of these terms, Cheung argues:

> In construing claim terms, it is also appropriate to consider how one skilled in the art would understand the terms. As the Federal Circuit put it in Eastman Kodak Co. v. Goodyear Tire & Rubber Co., 114 F.3d 1547, 1555, 42 USPQ2d 1737, 1742 (Fed. Cir. 1997)[,] "As a general rule, the construing

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[11] "Anneal" as used in the specification is broad enough to include self-annealing at room temperature ('613 specification at 17, ll. 18-22) as well as annealing at higher temperatures, e.g., "temperatures of about 250 degrees Celsius and below" (id. at 18, ll. 12-13).

> court interprets words in a claim as one of skill in the art at the time of the invention would understand them. . . . Therefore the testimony of one skilled in the art about the meaning of claim terms at the time of the invention will almost always qualify as relevant evidence."

Motion 2, at 17. Cheung's reliance on this Eastman passage overlooks the fact that it follows the court's conclusion that the district court properly considered such testimony after concluding that the meaning of the disputed claim could not be ascertained from the intrinsic evidence. 114 F.3d at 1553-55, 42 USPQ2d at 1741-42. Where, as here, the intrinsic evidence is sufficient to establish the meanings of the disputed terms, consideration of such extrinsic evidence is not permitted, as explained in Eastman:

> If, of course, the meaning of the claims is clear from their language in view of the context provided by the specification and the prosecution history, the trial court should limit its consideration of extrinsic evidence. See Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1583, 39 USPQ2d 1573, 1577 (Fed. Cir.1996). Extrinsic evidence--whether providing context for the claims or explaining claim meaning to one of skill in the art--cannot contradict claim language. Id.

Eastman, 114 F.3d at 1555, 42 USPQ2d at 1742.

In any event, assuming for the sake of argument that the foregoing intrinsic evidence fails to settle the interpretation question, Dr. Geffken's testimony (CX 2009) fails to persuade us that the terms "thermal anneal chamber" and "annealing chamber" in Ritzdorf's claims should be limited to sealed enclosures having tops, bottoms, and surrounding sides. Moreover, we will assume, without deciding, that Dr. Geffken is qualified to express opinions mentioned in his declaration. The preliminary motion (at 5-6, ¶¶ 7, 9) relies on the following parts of paragraphs 11 and 16 of Dr. Geffken's testimony, of which the sentences in paragraph 11 are identified by letters for purposes of discussion:

> 11. [(a)] In semiconductor substrate processing apparatus, chambers are typically used when the particular process requires a controlled gaseous environment, e.g., sputtering deposition and chemical vapor deposition. [(b)] Traditionally annealing of a metal refers to the application of heat to cause a change in the grain structure of the metal. [(c)] Annealing processes may or may not require a controlled gaseous environment. [(d)] E.g. metals such as gold and other noble metals are relatively inert in the presence of oxygen at elevated temperatures so a controlled gaseous anneal environment is not necessary. [(e)] The gaseous environment during anneal for non-noble metals such as Cu [copper] may also not need to be controlled if the anneal temperatures and times are relatively low, e.g., in the vicinity of 100 °C for 30 minutes, since the oxidation rates at these temperatures are relatively low. [(f)] However, for anneal temperatures in the range of 250 °C - 400 °C, the oxidation rates of Cu are substantial, and therefore strict control of the gaseous environment is required. . . . [(g)] Clearly annealing in [a] temperature range[] of 250°C - 400 °C requires a chamber to provide a controlled gaseous environment..
>
> . . . .
>
> 16. One skilled in the art reading claims 68, 70, 73 of the Ritzdorf application . . . would understand that the "annealing chamber" of claim 70 and the "thermal anneal chamber" of claims 68 and 73 would have an enclosure, based upon the normal, dictionary meaning of the word "chamber" as an "enclosed space" and the use of chambers to provide controlled gaseous environments when needed in semiconductor processing, even though the Ritzdorf specification (Cheung Exh. 2002) did not include a chamber.

In view of Cheung's above-noted concession at oral hearing that the term "chamber" does not imply the presence of a top, Dr. Geffken's paragraph 16 testimony is unconvincing to the extent offered to prove that "chamber" in and of itself implies a sealed enclosure having a top, bottom, and sides. For the same reason, his sentence (a) assertion that "chambers" are used to control gaseous environments during sputtering deposition and vapor deposition is based on an unduly narrow interpretation of that term. His sentence (b) assertion that the traditional meaning of annealing of a metal refers to the application of heat to cause a change in its grain structure of a metal and his sentence (c) assertion that annealing processes may or may not require a controlled

gas environment are both consistent with the ordinary definitions of "anneal" and "chamber" arrived at above. The same is true of his sentence (d) assertion that the annealing of gold and other noble metals do not require control of the gaseous environment and his sentence (e) assertion that a sealed enclosure is not required when annealing copper at low temperatures for short times. In fact, Ritzdorf's application, as noted above, contemplates annealing copper metallizations at temperatures as low a room temperature ('613 specification at 17, ll. 18-22). The sentence (f) and (g) statements regarding the known need for an sealed enclosure when annealing copper at 250 °C - 400 °C are irrelevant because the claims do not specify annealing at temperatures in that range. Moreover, these temperatures exceed those contemplated by Ritzdorf, which are temperatures of "about 250 degrees Celsius and below" (id. at 23, ll. 8-9).

For the foregoing reasons, whether or not Dr. Geffken's testimony is entitled to consideration we are of the view that the terms "thermal anneal chamber" and "annealing chamber" in Ritzdorf's claims, when given their broadest reasonable interpretation consistent with Ritzdorf's originally filed disclosure, refer to an annealing apparatus which has surrounding sides and which may or may not form a sealed enclosure. The question before us, therefore, is whether Ritzdorf's involved '613 application describes a system including such an annealing apparatus as well as the other claimed components.

As explained in Cordis Corp. v. Medtronic AVE Inc., 339 F.3d 1352, 1364, 67 USPQ2d 1876, 1885 (Fed. Cir. 2003):

> Paragraph 1 of section 112 of the Patent Act provides that the "specification shall contain a written description of the invention." To fulfill the written description requirement, the patent specification must describe an

invention in sufficient detail that one skilled in the art can clearly conclude that the inventor invented what is claimed. Lockwood v. Am. Airlines, Inc., 107 F.3d 1565, 1572 [41 USPQ2d 1961, 1966] (Fed. Cir.1997); In re Gosteli, 872 F.2d 1008, 1012 [10 USPQ2d 1614, 1618] (Fed. Cir.1989). The disclosure as originally filed does not, however, have to provide in haec verba support for the claimed subject matter at issue. See Fujikawa v. Wattanasin, 93 F.3d 1559, 1570 [39 USPQ2d 1895, 1904] (Fed. Cir.1996).

Ritzdorf's '613 application discloses a number of embodiments of the Ritzdorf invention, which as noted above is based on the discovery that satisfactory annealing of copper metallizations can be achieved using annealing temperatures much lower than the traditional annealing temperature of about 400 °C. This discovery is described in the specification with reference to Ritzdorf's Figures 2E and 2F, with Figure 2F showing the structure of Figure 2E after chemical mechanical polishing and annealing ('613 specification at 11, ll. 3-18):

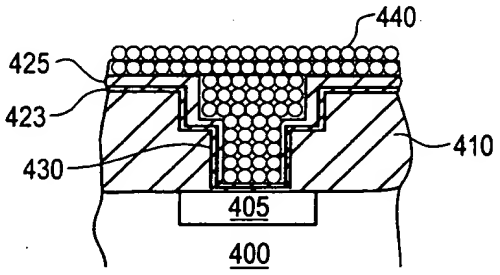

FIG. 2E

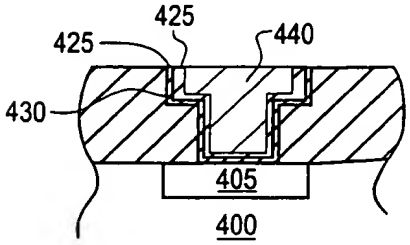

FIG. 2F

The specification explains:

> A comparison between Figs. 4E and 4F [sic: 2E and 2F] reveals that an increase in the grain size of the copper layer 440 has taken place. Traditionally, the change in the grain size has been forced through an annealing process. In such an annealing process, the wafer is subject to an elevated temperature that is substantially above the ambient temperature conditions normally found in a clean room. For example, such annealing usually takes place in a furnace having a temperature generally around or slightly below 400 degrees Celsius, or about half of the melting temperature of the electrodeposited copper. . . .
>
> Absent such an annealing step, the traditional view is that the substantial number of grains per given volume in such sub-micron structures significantly decreases the electromigration resistance of the metal lines that are produced and gives the material a higher resistivity. This is due to the fact that grain boundary migration occurs with a much lower activation energy that trans-granular migration. As such, conventional wisdom dictates that a separate annealing step is required.
>
> The present inventor has found that such a separate annealing step in which the electrochemically deposited copper is subject to a subsequent high temperature annealing process (e.g., at about 400 degrees Celsius) is not, in fact, necessary. Rather, electrochemically deposited copper metallization having grain sizes substantially smaller than the sub-micron structures that they fill may be subject to an annealing process in which the annealing of the copper metallization takes place at, for example, room temperature or at temperatures substantially below 400 degrees Celsius where the annealing process is more easily controlled and throughput is increased.

Id. at 11, l. 16 to p. 13, l. 3 (our emphasis). The reference to "furnace" in the first of these paragraphs is clearly limited to prior-art, high-temperature annealing and thus does not demonstrate an intent by the Ritzdorf inventors to employ an annealing furnace in their invention, as asserted in Ritzdorf's opposition in arguing that this annealing furnace provides written description support for the annealing "chamber" recited in Ritzdorf's claims. Opposition 2, at 5, ¶ 8.

On the other hand, we agree with Ritzdorf that the following passage demonstrates an intent to employ an annealing "oven" in Ritzdorf's invention:

> In accordance with a still further embodiment of the method, the copper metallization layer may be annealed before or after chemical mechanical polishing at an elevated temperature which is substantially below the temperature used in the annealing processes that have been traditionally employed. To this end, the wafer having the metallization layer may be placed in an oven having a temperature that is substantially below the 400 degrees Celsius traditionally thought to be necessary to promote the annealing process of copper having such small grain sizes. At a low temperature of about 60 degrees Celsius, the annealing process may be completed in about 15 minutes. At temperatures above 100 degrees Celsius, the annealing times become so short (<1 minute) so as to make annealing at higher temperatures unwarranted and wasteful.

'613 application at 18, ll. 5-13 (our emphasis). Cheung does not deny that such an annealing "oven" constitutes an "annealing chamber" in the sense of Ritzdorf's claims. Instead, Cheung denies that this annealing oven is described in the specification as part of a plating "system" which also includes the other elements recited in Ritzdorf's claims. Reply 2, at 7. This argument overlooks the fact that the above-quoted discussion of using an annealing "oven" in the invention is preceded by a discussion of using the electrochemical deposition apparatus of Figure 1 to form the copper metallization (id. at 13, l. 4 to p. 15, l. 15) and the statement that "[s]ubsequent rinsing and drying steps may be executed on the wafer in, for example, other processing chambers dedicated to such functions." Id. at 15, l. 21 to p. 16, l. 1. Thus, the inventors contemplated using the annealing oven as part of a system includes all of these components. Furthermore, although the specification does not explain how wafers are moved in and out of such a system and between the system components, it is evident that some known type of wafer transferring apparatus must have been contemplated for that purpose, such as the robots 620 and track 625 in

the plating systems of Figure 16 and 17, reproduced below, which represent an LT-210™ electrochemical plating system from Semitool as modified by the inventors to include an annealing station 615 in Figure 16 and 630 in Figure 17 (id. at 27, ll. 18-22).[12] Numerals 610 designate one or more rinsing/drying stations and one or more electroplating stations (id. at 28, ll. 1-4).

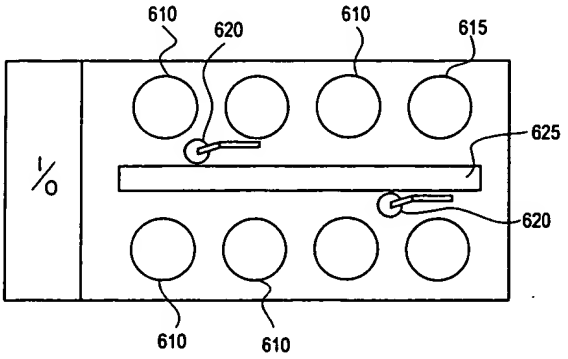

FIG. 16

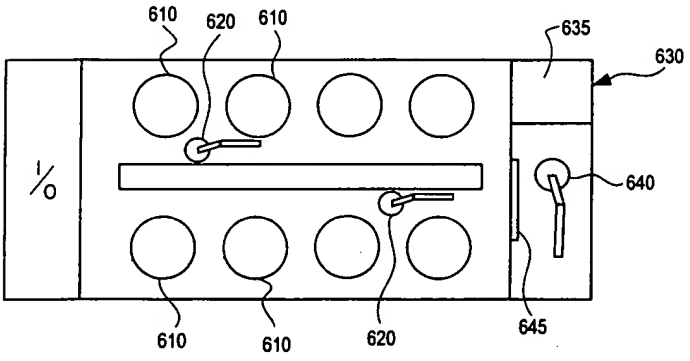

FIG. 17

[12] Mr. Ritzdorf testified that "[a]t the time that the Equinox® plating system developed [by Semitool] in 1996 and 1997, it was not obvious or recognized as beneficial to utilize an annealing station in combination with electrolytic deposition of copper. While it may have been known, as Cheung argues, that CVD might be used on the same platform with annealing, no one had previously suggested an annealing chamber in combination with electrolytic deposition of copper on the same platform." Ritzdorf Decl. (RX 1009) ¶ 30.

In reaching this conclusion, we are mindful that the systems depicted in Figure 17 are specifically described as showing how the embodiments of annealing apparatus shown in Figures 11-15 can be integrated into a wet chemical tool set (id. at 5, ll. 20-21, and p. 27, ll. 20-22). As discussed below, in addition to generating lower-than-traditional annealing temperatures, these embodiments advantageously produce temperature gradients in the wafers and copper metallization layers.

As further evidence that the inventors did not consider their plating systems to be limited to annealing stations of the temperature-gradient type, we note that originally filed apparatus claims 41-44 recite the combination of a deposition station, an annealing station, and workpiece-handling robots without requiring temperature-gradient annealing, which instead is recited in dependent claims 45-54.

For the foregoing reasons, we agree with Ritzdorf that the '613 application describes an electroplating system satisfying all of the limitations of claim 70, which is identical to Cheung claim 1 and thus the count:

70. A system for depositing a layer on a substrate, comprising:

at least one electrolyte processing cell;

at least one annealing chamber;

at least one substrate cleaner; and

a substrate transfer apparatus adapted to access the electrolyte processing cell, the annealing chamber, and the substrate cleaner.

We reach the same conclusion with respect to independent claims 68[13] and 73.[14] The "loading station" recited in claim 68 reads on the I/O portion of the prior-art system shown in Figures 16 and 17, which we conclude was also contemplated by the inventors for use with the aforementioned annealing "oven." The "mainframe" and "mainframe wafer transfer robot" recited in claim 73 read on the overall structure and robots 620 in the Figure 16 system, which we likewise conclude was contemplated for use with the aforementioned annealing "oven." The recited "electrolyte supply" is not shown in Figure 1 but will necessarily be connected to the fluid inlet line 165 ('613 specification at 7, l. 2).

In addition to concluding that written description support for claims 68, 70, and 73 is provided by the annealing "oven" disclosure, we agree with Ritzdorf's alternative argument that

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[13] Claim 68 reads:

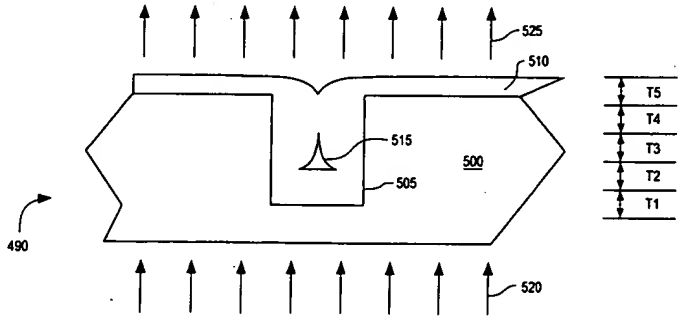
68. An electro-chemical deposition system, comprising:
a) a wafer transfer apparatus;
b) a loading station disposed in connection with the wafer transfer apparatus;
c) one or more processing cells disposed in connection with the wafer transfer apparatus;
d) an electrolyte supply fluidly connected to the one or more processing cells;
e) a wafer cleaner station disposed in connection with the wafer transfer apparatus; and
f) a thermal anneal chamber disposed in connection with the wafer transfer apparatus.

[14] Claim 73 reads:

73. An electro-chemical deposition system, comprising:
a) a mainframe having a mainframe wafer transfer robot;
b) a loading station disposed in connection with the mainframe;
c) one or more processing cells disposed in connection with the mainframe;
d) an electrolyte supply fluidly connected to the one or more processing cells;
e) a rinse-dry (RD) chamber disposed for access to the loading station; and
f) a thermal anneal chamber disposed for access to the loading station.

such support is also provided by Figures 16 and 17 when employed with at least one of the temperature-gradient annealing apparatuses shown in Figures 11-15, which "create[] a temperature gradient through the cross-section of the workpiece [wafer] 490," thereby producing in the copper film 510 "a stress gradient that provides a driving force which promotes recrystallization of the copper film 510." Id. at 24, ll. 5-10. This temperature gradient is represented by temperature regions T1-T5 in Figure 8:

FIG. 8



Of the five different embodiments of annealing apparatus for producing such temperature gradients, Figure 11, the most relevant, is reproduced below:

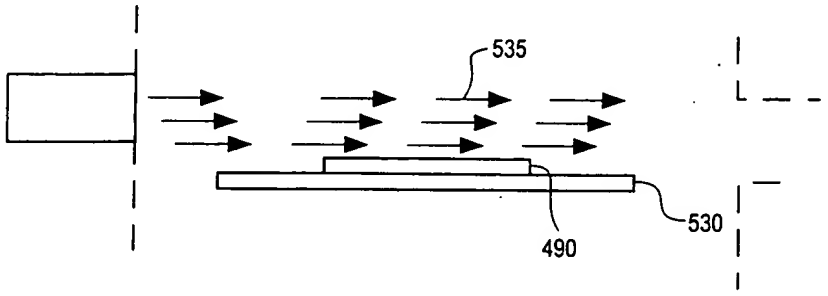


FIG. 11

The wafer or workpiece 490 is supported on its bottom side by a hot plate 530 while cooling air 535 moves from left to right across the top surface, as indicated by arrows 535. Id. at 24, ll. 18-22. Although not discussed in the specification or given reference numerals, the dashed lines at the left and right sides of the figure appear to represent left and right side walls. Adjacent to and outside the left wall is a rectangle which we assume, based on the position and direction of arrows 535, represents the source of the cooling air. The right side wall includes an opening through which the cooling air presumably exits after passing over the wafer. While the figure does not show front and back side walls, it is reasonable to assume they were omitted from the drawing because their presence is not required to show the path of the cooling air across the wafer. Thus, we conclude that this figure is sufficient to show that the inventors envisioned an annealing apparatus having surrounding sides, thereby satisfying the annealing "chamber" terminology of independent claims 68, 70, and 73. Furthermore, when this annealing apparatus is employed in the system depicted in Figure 16, the "system" limitation and the remaining elements of these claims are also satisfied for the reasons given above in the discussion of the annealing "oven" embodiment.

For the same reasons, these claims read on the system depicted in Figure 17, reproduced above, when it employs the annealing apparatus of Figure 11 as the heating unit 635 in annealing station 630. However, we note in passing that although heating unit 635 is described as being "separate" and although annealing station 630, which contains heating unit 635 and a dedicated robotic mechanism 640, is connected to the other system component through "an intermediate staging door/area 645" (id. at 28, ll. 10-14), we do not agree with Ritzdorf that these

characteristics provide an independent basis for concluding that annealing station 630 or heating unit 635 inherently include surrounding walls and thus are "chambers" in the sense of Ritzdorf's claims. Nor are we so persuaded by the following statements about Figure 17 in the specification: "As such, it becomes possible to hygienically separate the annealing station 630 from other portions of the tool set. Additionally, the illustrated annealing station may be implemented as a separate module that is attached to upgrade an existing tool set." Id. at 28, ll. 15-18. These statements leave open the possibility that the hygienic barrier is formed around the "other portions" of the tool set rather than around the annealing station or the heating unit.

Because claims 68, 70, and 73 have 35 U.S.C. § 112, ¶ 1 written description support in Ritzdorf's involved '613 application, Cheung Preliminary Motion 2 is denied with respect to those claims as well as with respect to dependent claims 69 and 71, which are not separately argued in the motion and specify that the substrate cleaner is "a rinse/dry chamber."

Claim 72, which depends on claim 70, specifies that "the substrate transfer apparatus comprises a first robot positioned to access the substrate cleaner and the electrolyte processing cell, and a second robot positioned to access the substrate cleaner and the annealing chamber." Ritzdorf would have us read the claimed first robot on one of robots 620 and the claimed second robot on robot 640 in Figure 17. Cheung disagrees, arguing that the robot 640 does not directly access a wafer inside a rinse/dry station 610 (i.e., substrate cleaner), which instead are directly accessed only by robots 620. Ritzdorf correctly counters that the claim does not require direct access to the substrate cleaner by the second robot. The claimed first robot can be read on one of

robots 620, while the claimed second robot can be read on the combination of one of robots 620 and robot 640. Preliminary Motion 2 is therefore denied with respect to claim 72.

Claim 74, which depend on claim 73, specifies that "the thermal anneal chamber comprises a rapid thermal anneal chamber having a heater plate." The motion, citing paragraph 17 of Dr. Geffken's testimony, argues:

> As noted by Dr. Geffken, the term "rapid thermal anneal" is synonymous with a rapid rise in the temperature of a wafer followed by a rapid decrease in wafer temperature. The Ritzdorf specification repeatedly touts creating a temperature gradient across the copper film by employing heater apparatus that heat one side of the wafer at the same time the other side is being actively cooled, something that would prevent it from functioning as a rapid thermal anneal heater. There is also no mention in the Ritzdorf application of subsequent rapid decrease in wafer temperature that is also characteristic of rapid thermal anneal processes. (Cheung Exh. 2009, ¶ 17) (Cheung Fact 26)..

Motion 2, at 23. Ritzdorf's opposition does not question Dr. Geffken's definition of "rapid thermal anneal" as requiring a rapid increase in wafer temperature followed by rapid decrease in temperature. Furthermore, although Ritzdorf alleges that rapid heating is shown in Figures 9 and 10, reproduced below, which the specification characterizes as demonstrating that "[h]igher magnitude ramp rates will result in larger temperature gradients, particularly at the end of the ramp" ('613 specification at 24, ll. 15-16), Ritzdorf does not explain -- nor is it apparent to us -- where the '613 specification describes subsequent rapid cooling.

FIG. 9

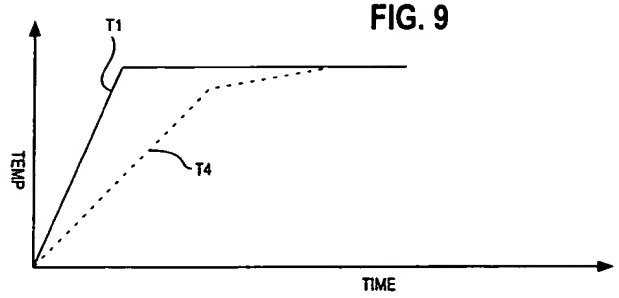
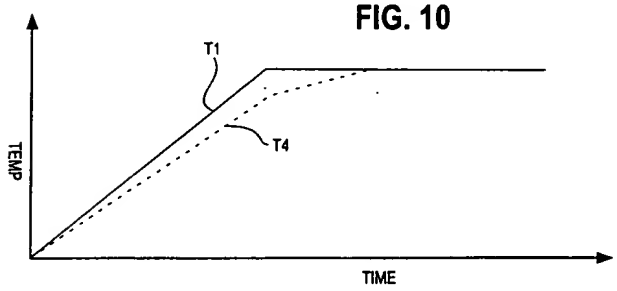


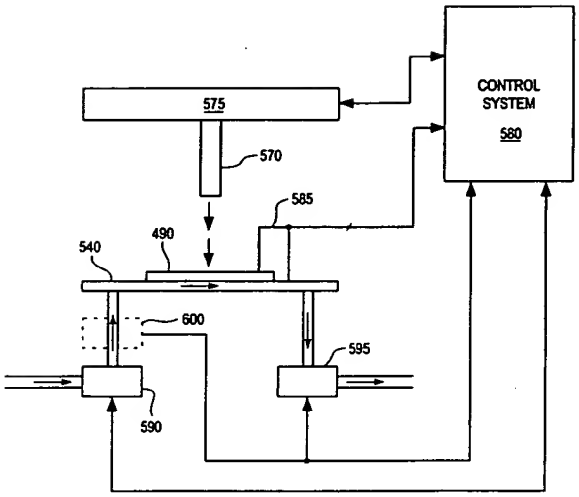
FIG. 10



Preliminary Motion 2 is therefore granted with respect to claim 74 and its dependent claim 75.

Claim 76 specifies that the system recited in claim 73 further comprises "a system controller adapted to control operations of one or more components of the electro-chemical deposition system." Ritzdorf's "Amendment Under 37 C.F.R. § 1.607" in the '613 application asserts that this limitation reads on the control system 580 in Figure 15, reproduced below, which shows a temperature-gradient-type annealing apparatus employing a laser as the heating source:

FIG. 15



Ritzdorf's reliance on this annealing apparatus is misplaced because it is not described as having surrounding sides, as required to satisfy the "thermal anneal chamber" limitation of claim 73, on which claim 76 depends. Preliminary Motion 2 is therefore granted with respect to this claim as well as its dependent claim 77.

In summary, Cheung Preliminary Motion 2 is granted with respect to Ritzdorf's claims 74-77 and denied with respect to claims 68-73. Accordingly, in a separate judgment paper being mailed herewith, judgment is being entered against Ritzdorf's claims 74-77 under 35 U.S.C. § 112, first paragraph, for lacking written description support in Ritzdorf's involved application.

D. Cheung Preliminary Motion 1

Cheung Preliminary Motion 1 under 37 CFR § 1.633(f) attacks Ritzdorf's benefit of each of the following applications with respect to Count 1, which is Cheung's claim 12, of which Ritzdorf's claim 70 is a copy:

(a) U.S. Application 09/386,734, filed 31 August 1999;

(b) PCT/US/02504, filed 4 February 1999;

(c) U.S. Provisional Application 60/087,432, filed 1 June 1998; and

(d) U.S. Application 09/018,783, filed 4 February 1998.

The specifications and drawings of the '734 and PCT applications are identical to those of Ritzdorf's involved '613 application[15] and thus provide written description support for Count 1 for the same reasons that the '613 application provides written description support for Ritzdorf's claim 70. Accordingly, Preliminary Motion 1 is denied with respect to the '734 application and the PCT application. "If a party is entitled to rely on an earlier filed application and the specification of that application shows a constructive reduction to practice of the count, no further evidence is needed to prove invention as of the filing date of that application." Stevens v. Tamai, No. 03-1479, slip op. at 7-8 (Fed. Cir. May 4, 2004) (citing Hyatt v. Boone, 146 F.3d 1348, 1352, 47 USPQ2d 1128, 1130 (Fed. Cir. 1998)).

Apart from lacking claims and having different pagination, the provisional application appears to be identical to the involved application, including the above-discussed dashed lines in Figure 11. Preliminary Motion 1 is therefore also denied with respect to the provisional application.

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[15] The '613 application at 1, amendment insert A1, identifies itself as a continuation of the '734 application, which at 1, amendment insert C1, identifies itself as a continuation of the PCT application.

The 1 June 1998 filing date of the provisional application predates the 1 November 1998 conception date alleged in Cheung's preliminary statement.[16] Preliminary Motion 1 is therefore dismissed as moot with respect to Ritzdorf's '783 application, filed 4 February 1998.

Because Cheung's preliminary statement fails to allege a date of invention prior to the 1 June 1998 benefit date of Ritzdorf's provisional application, judgment on the issue of priority is being entered against Cheung's involved claims and in favor of Ritzdorf's claims in the accompanying "Judgment -- Rule 640."[17]

E. Summary

In the accompanying "Judgment -- Rule 640," judgment being entered (a) against Cheung's involved claims 1-5 and 10-14 on the ground that Ritzdorf has prevailed on the issue of

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[16] Paper No. 29.

[17] Judgment on priority is being entered pursuant to 37 CFR § 1.640 because it rests on the failure of Cheung's preliminary statement to allege date of invention prior to Ritzdorf's 1 June 1998 benefit date, a ground for judgment given in § 1.640(d)(3). Issuance of a show cause order under § 1.640 is unnecessary, however, since the question of Ritzdorf's benefit has been argued at an oral hearing and is the subject of this panel decision.

priority and (b) against Ritzdorf's claims 74-77 for unpatentability under the written description provision of 35 U.S.C. § 112, first paragraph.

JOHN C. MARTIN
Administrative Patent Judge

FRED E. McKELVEY
Senior Administrative Patent Judge

RICHARD E. SCHAFER
Administrative Patent Judge

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Enclosure: The Random House Dictionary of the English Language 83 (2d ed. 1987).